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## HIGH BUILDINGS.

BY A. L. A. HIMMELWRIGHT.

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THE tower-like structures that have sprung up as if by magic within the past few years in the business portions of nearly all our large cities are indeed wonderful creations. These buildings are remarkable not only because they are unique in proportions and exemplify novel methods of construction, but also on account of their vast commercial importance. Take, for example, any of the larger office buildings, such as the "Manhattan Life," or the "Washington," in New York City, and the "Marquette" or the "Rookery," of Chicago. Buildings such as these shelter a host of persons engaged in mercantile and professional pursuits, who, in connection with their various occupations and enterprises, often employ as many as eight to ten thousand persons. Assuming that there are the usual five persons dependent upon each adult wage-earning male, it will be apparent that many of these buildings in supplying the necessary accommodations for the transaction of business furnish the means of support for forty to fifty thousand souls. When it is remembered that many of these buildings occupy areas less than one hundred feet square, the enormous value of building lots in the best business centres can be appreciated.

The reduced cost of iron and steel since 1888-90, the perfection of elevator mechanism, and improved methods of fire-proof construction have made the high buildings of to-day possible, as well as practicable and profitable. The old methods of construction, in which the walls were designed to carry the weight of the various floors and the roof, have been revolutionized, and the steel skeleton frame now supports the entire structure, including in many cases even the exterior walls. The improved elevator service renders the upper stories of a building almost as

accessible as those nearer the street level, while the former have usually the advantage of being better lighted and ventilated. As a result of these conditions, story after story has been added until twenty-story buildings are quite numerous, and twenty-five and twenty-eight story buildings are in the course of erection. Nor has the limit of the height of the steel skeleton-frame structures been even approximately reached. Buildings of fifty or sixty stories are evidently as feasible as those of thirty stories if the additional proportional cost of the foundations and structural iron should prove no obstacle to investors. Actual buildings of such enormous heights will, however, probably never be realized. This assertion is made, not on account of any apparent engineering or architectural difficulties, but because, sooner or later, there will be found a limit in the height of buildings depending upon many and varying conditions for each locality, beyond which they will no longer be profitable investments.

A few observant persons have discovered objectionable features in some of the high buildings. These have been publicly discussed from a prejudiced standpoint with the result that many regard high buildings with disfavor, and even with suspicion. They ask, "Are these buildings safe?" "Do they not shut out much-needed light and air?" "Will they not destroy the effect of beautiful architectural designs of adjacent buildings, and mar the beauty of our streets?" These are pertinent questions that may well command careful attention and study.

Antiquated laws framed before the advent of steel construction, neglectful owners, incompetent architects, unprincipled and careless builders, and the false economy of some of our municipal governments in failing to provide and maintain an alert and efficient building department—are all conditions that cannot fail to breed reckless as well as faulty construction. Occasional failures of buildings causing destruction of life and property are substantial proofs that at least some of these conditions exist in nearly every city. These failures, which are so eagerly snatched up and heralded by the daily press, are largely responsible for the popular but mistaken inference that all high buildings must necessarily be unsafe and possibly dangerous.

It may be stated authoritatively that when good and suitable foundations are provided, and the other details of the construction designed and carried out in accordance with the best modern

practice, the high steel frame building of to-day is absolutely safe under all physical conditions prevalent in this latitude.

The liability of iron and steel to oxidize (or rust) is the principal defect in this system of construction. To prevent this evil, the structural iron when erected is treated to one or more coats of paint. Special chemical processes are sometimes employed for a similar purpose. The protecting films thus produced, when composed of suitable substances and properly applied, are impervious to air and moisture and render oxidation impossible. When, later, the iron work is encased in masonry and plaster, its isolation from the atmosphere minimizes the danger of oxidation and practically eliminates it. There exist, however, in many buildings, local conditions favorable to oxidation which are unavoidable. To correct any possible damage that may result in such cases the ironwork is so designed that any part may be removed if desired and new material substituted. The length of time that paint or other coatings will remain effective under the various conditions that obtain in the average building has not as yet been determined. Until authentic information on this subject is available, extreme vigilance should be exercised and the ironwork inspected at regular intervals, not exceeding twenty years. In the best and more recent designs of high buildings, the ironwork is so disposed as to be readily accessible for inspection.

Another important feature which bears directly upon the subject of safety is the protection a building affords against fire. Previous to 1892 very little was known about practical methods of "fireproofing." It was assumed that, if all the materials used in the construction of a building were incombustible, the building would necessarily be fireproof. Small fires breaking out in such buildings, causing serious damage and occasionally wrecking the entire structure, have proved the fallacy of that assumption. In order that a building shall be fireproof it is not only necessary that the materials used shall be incombustible, but also that those materials shall be so adapted and employed to the best advantage, that they may effectually resist disintegration and retain their strength and firmness under all the conditions that may arise in the case of a conflagration and the subsequent operations of a fire department. Careful, conscientious study of the requirements and the observation of the effect of fire and

water on different materials have rapidly developed more efficacious methods in fireproof construction. The structural iron is now carefully encased and protected, the principle of air-spacing successfully and economically applied and all woodwork so far as practicable is replaced by stone, cement, metal, or glass. In fireproof buildings designed for business purposes the question of cost frequently precludes the use of the best materials. Until an equally low-priced substitute can be found, wood will be largely used for much of the interior finish and trimming. However undesirable this may seem in a fireproof building, actual fires have demonstrated that all the combustible material in several rooms may be consumed without any serious injury to the building, and that the fires are easily controlled and extinguished. The total damage in such cases is represented by the expense of replacing the consumed woodwork and furniture and restoring the damaged plaster.

The leading argument against high buildings is that they obstruct the light. Localities such as Nassau street, near Printing House Square in New York City, are pointed out as illustrating the wanton and exorbitant appropriation of sunshine and air. It is asserted that the high buildings at such places produce the effect of continuous walls on both sides of the narrow streets intercepting the light and rendering the streets dark and gloomy except for an hour or two at mid-day; that the offices and stores in the lower stories are dark; and that the circulation of pure air is greatly impeded. While these assertions are undoubtedly true, their application is much more general than is here assumed.

Everyone who is familiar with lower New York and other closely built up sections of our large cities, is well aware that block after block of buildings presents a solid front on the streets. The depth of the buildings generally averages between sixty and ninety feet, the average frontage about twenty-five feet, and the average height, five to seven stories. These buildings, flanked on both sides by solid party walls, are wholly dependent for light upon the windows in the front and rear. In some instances additional light is obtained by means of sky-lights in the roof. The majority of these buildings are dismally dark and artificial light must invariably be resorted to whenever they are to be used for business purposes. Even four or five-story residences, built

under the same conditions, can boast of only a few well-lighted rooms in the front and rear, while the hallways and the interior rooms are gloomy and cheerless. When we find the same conditions as to light in four and five-story buildings as we do in extremely high ones, is it not evident that the problem of lighting must be largely independent of the height of the buildings?

What, then, is the difficulty? The answer is, faulty designing, primarily, and inadequate building laws. It is to be regretted that there are many architects (or more properly draughtsmen) who for a consideration are willing to smother whatever professional pride they may possess and, in opposition to their better judgment and good taste, cater to the vicious greed of unprincipled speculators and owners. Many of these speculators, intent upon securing the maximum floor areas, are entirely willing and often anxious to sacrifice light and ventilation to secure their object. Unfortunately the existing laws are not sufficiently definite or comprehensive to exercise the requisite corrective or prohibitory measures in such cases.

The question of light and air is, from a sanitary point of view, one of vital importance in the design of any building, be it a private residence, or a city hall. If the lot is bounded by high walls, it is distinctly the province as also the prerogative of the architect either to limit the area occupied by the building, or to introduce light shafts or courts suitable in number and size to afford sufficient light. The fact that there are so many poorly lighted buildings in all our large cities is conclusive evidence that the problem of light and air can only be regulated by judicious legislation. To arbitrarily limit the height of buildings in proportion to the width of the street on which they front, as was suggested in a bill recently introduced by a member of the New York State Legislature, would prove a serious blow to owners of real estate, and would certainly fail to correct a single one of the many flagrant evils that now exist. The bill serves, however, as an illustration of the vast amount of injury and the small amount of good that might result from bad legislation.

In Paris and Berlin a building may occupy only a certain prescribed proportion of the area of the lot on which it stands. A similar law exists in some of the larger cities of this country. These laws are very desirable in that they prevent the usurpation of space that is absolutely necessary for maintaining proper sani-

tary conditions. The building laws both here and abroad permit, however, the entire frontage of a lot to be built up solid. This, in my opinion, is the root of all the evil. A law should be framed prescribing that only a certain proportion of the total frontage in the middle of the lot may be occupied by a building. A passage for light and air would thus be provided between all buildings which would render each independent of any and all others as regards light. Such a law would have many other advantages. It would afford better protection against fire and would facilitate the operations of the fire departments. Many of the perplexing difficulties experienced by owners of adjoining properties, when excavating for new buildings, would be obviated. The necessary stability as regards the maximum wind pressures would, to a large degree, determine the width (generally the frontage) of high buildings. The higher the building, therefore, the greater would be its frontage and likewise the greater would be the space between it and adjoining buildings. A practical illustration may make this statement clearer. Assume that a law as suggested prescribes that a building may occupy 80 per cent. of the middle portion of the frontage of a lot, and 72 per cent. of its total area. Let us select a twenty-six story building that is to be 320 ft. in height above the street level. In order to be stable under the highest wind pressures that have been observed in this latitude, this building should have an average minimum width or frontage of about 40 ft. The lot would consequently have a frontage of 50 ft. If, similarly, a building with a front 20 feet wide occupied an adjoining lot having a frontage of 25 feet, the space between the two buildings would be  $7\frac{1}{2}$  feet. Again, if another building like the first were to be erected on a lot adjoining it, the space between them would obviously be 10 feet.

No more difficult problem has ever been presented to architects than the artistic designing of high buildings. When this problem is still farther complicated by the necessity of adapting the design so that it may harmonize with those of adjoining buildings, the task becomes well-nigh hopeless, and satisfactory results are seldom realized. If, on the other hand, all buildings were isolated, as is here proposed the utmost liberty of design and freedom of action would ensue. "The accomplished and experienced architect versed in all the historical practices of his

art, gifted with imagination, inventive powers and common sense," unembarrassed by adventitious circumstances, could summon all his resources and produce results at once original, artistic and effective. Nor would his creation be marred or robbed of the smallest part of its grace and symmetry by contact with other designs; but complete and distinct in itself, sovereign in the simple yet potent charms born of the master hand, it would stand forth in its full glory—a fitting monument to genius and skill.

Fifteen years ago the idea of constructing twenty-five and thirty story buildings would have been deemed too wildly improbable to deserve consideration. They are now realized. Some of the tall buildings that have been erected since that time are, from an architectural standpoint, unattractive; but many of the more recent ones are beautiful and desirable. What the next fifteen years may develop can scarcely be conjectured. Artistic and philanthropic minds, assisted by intelligent legislation, may accomplish what may now seem miraculous. Instead of buildings wretchedly lighted and ventilated, composing the solid, wall-like street fronts with scarcely any variation of sky-line, color or design, there may be structures perfect in their adaptation to the special purposes each is to subserve, separated from each other by smooth walks, well-kept lawns, blooming flower gardens and clean streets; representing in their designs all that is best in every style of architecture from the remotest ages to the present time, enriched and diversified by color, and varying in magnitude from the romantic single-story Swiss cottage with thatched roof, to the towering office buildings piercing the sky with a thousand "turrets and spires and gilded domes."

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